

ADDITIONAL TREEFROGS (HYLIDAE) FROM THE NORTH
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Fossil treefrogs are comparatively rare. Published records are available from California, Florida, Kansas, Nebraska, Oklahoma, and Texas. These deposits range from Lower Miocene (Thomas Farm, Gilchrist County, Florida) to late Pleistocene deposits in Florida, Oklahoma and Texas. Except for the mention of "*Hyla* cf. *crucifer*" (Richmond in Guilday, *et al.*, 1964) and of "*Hyla* sp" (McCrary and Schmidt, 1963) no fossil treefrogs have been reported from the eastern United States outside of Florida.

Pleistocene treefrogs recently have been recovered from deposits in Maryland, Pennsylvania, and Tennessee. These specimens are part of the collections of the Section of Vertebrate Fossils, Carnegie Museum (CM). It is also possible to report the identifications of several treefrog fossils from the Wisconsin deposits of Hardeman County, Texas. Holman (1964) listed these fossils as "Hylidae indet."

Specimens identified by the abbreviation MU are from Midwestern University, Wichita Falls, Texas.

A characteristic useful in generic and specific identifications of hylid ilia has been pointed out by Holman (1962: 256) and Chantell (1964: 215). The position of the anterior edge of the dorsal protuberance relative to the anterior edge of the acetabular fossal border is divided into three categories by these authors: posterior to, even with, or anterior to. Holman's groups are less clearly defined than those of Chantell's and I follow Chantell's terminology.

In attempting to identify two hylid ilia from Hardeman County, Texas, I examined 414 ilia (Recent) of seven genera for protuberance position relative to the fossal border. When adequate series are available, it becomes apparent that there is often considerable variation in this character (Table 1). Most *Hyla* species have the protuberance even with or posterior to the anterior margin of the acetabular fossa but *Hyla crucifer* is a notable exception (Table 1).

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TABLE 1

POSITION OF ANTERIOR BORDER OF DORSAL PROTUBERANCE OF THE ILIUM RELATIVE TO ANTERIOR BORDER OF ACETABULUM IN 34 HYLID SPECIES (414 SPECIMENS)

Species	Posterior $\frac{1}{2}$	Even	Anterior $\frac{1}{2}$
<i>Acris crepitans</i>			108
<i>Acris gryllus</i>			12
<i>Agalychnis callidryas</i>	9	1	
<i>A. moreleti</i>	2		
<i>Diaglena reticulata</i>		2	
<i>D. spatulata</i>		2	
<i>Hyla andersoni</i>	2	4	
<i>H. arborea</i>	1	12	
<i>H. arborescendens</i>	1	14	1
<i>H. arenicolor</i>		1	
<i>H. avivoca</i>		8	
<i>H. cinerea</i>	4	20	2
<i>H. crepitans</i>	1	1	
<i>H. crucifer</i>		1	53
<i>H. euphorbiacea</i>	1	2	2
<i>H. gratiosa</i>		4	
<i>H. microcephala</i>	8	5	
<i>H. picta</i>		3	
<i>H. regilla</i>	1	4	1
<i>H. septentrionalis</i>	9	1	
<i>H. squirella</i>		6	2
<i>H. staufferi</i>		5	3
<i>H. versicolor</i>	1	26	1
<i>H. wrightorum</i>	1	1	
<i>Limnaoedus ocularis</i>		4	3
<i>Pseudacris brachyphona</i>		2	
<i>P. brimleyi</i>		2	
<i>P. clarki</i>			2
<i>P. nigrita</i>		2	2
<i>P. ornata</i>			2
<i>P. streckeri</i>		2	10
<i>P. triseriata</i>		19	11
<i>Pternohyla dentata</i>			2
<i>P. fodiens</i>		2	

Hyla crucifer (Wied)

MATERIAL: 2 left ilia and 1 right ilium (CM 12533); Sinkhole No. 4, New Paris, Bedford County, Pennsylvania; 11,300 B.P. \pm 1000 years, carbon dating (Guilday, *et al.*, 1964).

2 right ilia (CM 12576-12577), Cumberland Cave, east face, Alleghany County, Maryland; "pre-Wisconsin," Pleistocene.

The New Paris specimens are large, representing individuals 33 to 40 mm. in snout-vent length, thus exceeding the largest known Recent specimens (1¾ inches, Conant, 1958: 278). The two specimens from Cumberland Cave are smaller, about 30 mm. in snout-vent length. These fossils represent the first definite report of *Hyla crucifer* from the Pleistocene. Guilday *et al.* (1964) tentatively referred the New Paris specimens to this species.

It appears that the Pleistocene specimens of several species of frogs attained greater size than do modern specimens of the same species. Chantell (1964: 221) has reported larger *Acris* and *Pseudacris* and Mecham (1959) has recorded very large *Bufo woodhousei*. J. Alan Holman has permitted me to examine his specimens of *Rana catesbeiana*, from the Florida Pleistocene, which exceed 200 mm. in snout-vent length. The striking feature is not so much that these frogs were large but that the entire population of bullfrogs apparently was composed of giant (by present standards) specimens.

Hyla femoralis Sonnini and Latreille

MATERIAL: 1 right ilium (CM 12579), Robinson Cave, Overton County, Tennessee; Pleistocene, stage not determined.

The low ilial prominence makes fossil ilia of this species relatively easy to identify. The dorsal protuberance is directed laterally, oval, prominent, and relatively close to the acetabular fossa border. The angle of ventral expansion is large and the dorsal acetabular expansion is not directed so much dorsally as posteriorly, accentuating the flat appearance of the bone.

At present, this species occurs only in the southeastern United States. Its range does not extend north into the Mississippi Valley as it may have during one or more of the Pleistocene interglacial periods. The species has previously been recorded as a fossil from the Pleistocene of Florida (Holman, 1959, and Lynch, 1965), and a dubious record is available from the Mio-Pliocene of Nebraska (Chantell, 1964). The age of the deposits from Robinson Cave is not definitely known. According to Richmond (personal communication) the fossil was found in a

deposit that included armadillo, sloth, and caribou. Such an association (containing northern as well as southern indicators) suggests extensive mixing has occurred. Judging from the present distribution of *Hyla femoralis*, it would be reasonable to say that the fossil was deposited during an interglacial period when the range of *Hyla femoralis* extended up the Mississippi Valley.

Hyla holmani, new species

Two of the fossils reported by Holman as "Hylidae indeterminate" have the fossa-protuberance relationship intermediate between the "even with" and "anterior $\frac{1}{2}$ " groups of Chantell (1964). On the basis of the proximity of the protuberance to the fossa and the shape of the ventral acetabular expansion these specimens are referred to the genus *Hyla*.

Comparison of the fossils with the species of *Hyla* in eastern Texas (*chrysosecelis*, *cinerea*, *crucifer*, *squirella*, and *versicolor*) as well as with those of the rest of the United States and northern Mexico, indicates that the fossils represent an undescribed (and presumably extinct) species:

HOLOTYPE: MU 6581, distal 5.1 mm. of a left ilium (Fig. 1), Walter W. Dalquest, collector.

REFERRED SPECIMEN (1): MU 6582, fragmentary right ilium.

TYPE LOCALITY: Groesbeck Creek Fauna, 5 miles north, 1 to 2 miles west of Quanah, Hardeman County, Texas.

HORIZON: Wisconsin glacial, Pleistocene.

DIAGNOSIS AND DEFINITION: A *Hyla* of uncertain affinities whose ilia can be distinguished from those of other North American species by the following: acetabular fossa shallow; dorsal protuberance ovoid, its anterior edge slightly anterior or even with anterior border of acetabular fossa; protuberance separated from dorsal border of fossa by distance about equal to three-quarters the depth of the protuberance; ventral acetabular expansion reduced, extending well along the ilial shaft as a narrow expansion (Fig. 1); no ilial shaft ridge.

DESCRIPTION OF HOLOTYPE: Fig. 1A, distal 5.1 mm. of a left ilium; most of ventral acetabular expansion broken; anteriorly the expansion is a narrow ridge-like structure along the ventral edge of the ilial shaft; acetabular fossa large, shallow, rounded; dorsal acetabular expansion lost through breakage; ilial prominence massive, ovoid, with roughened surface, its anterior edge just in front of the anterior edge of the acetabular border; shaft without ridges or crests.

The referred specimen (Fig. 1B) is slightly smaller and less complete and has a much better defined dorsal protuberance. It is referred to *Hyla holmani* on the basis of the shape of the ventral acetabular expansion.

COMPARISONS: All other North American *Hyla* and *Pseudacris* examined have a broader ventral acetabular expansion with the possible exception of a Mio-Pliocene fossil form (*Hyla* sp., Valentine formation, Nebraska, Chantell, 1964). This fossil is fragmentary and the detail of the illustration is not clear, but it may be related to *Hyla holmani*.

The dorsal protuberance and ilial prominence of the *versicolor* group (see Lynch, 1965, for definitions of the species groups) are wholly dissimilar to the fossil *holmani* in being triangular or subtriangular. In the *goini* group, the protuberance is situated much closer to the dorsal border of the acetabular fossa, and in the *crucifer* group, the prominence is more antierad and there is an ilial shaft ridge (Lynch, 1962, 1965). The dorsal protuberance most closely resembles that of the *cinerea* group, of which *holmani* may be an extinct member, but a definite statement as to the relationships of *holmani* must await collection of more specimens.

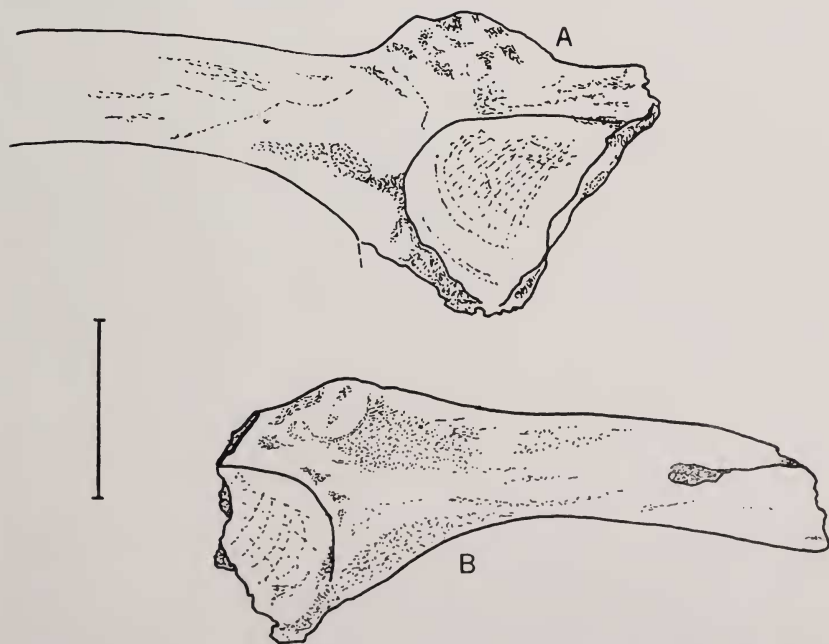


Figure 1. A. Holotype left ilium of *Hyla holmani*, new species, MU 6581. B. Referred specimen of same, MU 6582. Line represents 1 mm.

Acris crepitans Baird

MATERIAL: 5 ilia (3 right, 2 left), MU 3260, Groesbeck Creek, Hardeman County, Texas; Wisconsin glacial, Pleistocene.

Holman (1964:76) reported these fossils as "Hylidae indeterminate." However, they are very fragmentary remains of *Acris* as evidenced by the shape of the ventral acetabular expansion and the position of the dorsal protuberance. The fossils appear to represent individuals 25 to 30 mm. in snout-vent length. Holman had recorded the species from this site.

Pseudacris streckeri Wright and Wright

MATERIAL: 1 left ilium (distal 4 mm.), MU 3259, Groesbeck Creek, Hardeman County, Texas; Wisconsin glacial, Pleistocene.

Holman (1964) included this specimen in his "Hylidae indeterminate." *Pseudacris streckeri* can be recognized by the ball-like dorsal protuberance of the ilial prominence. The fossil represents an individual about 30 mm. in snout-vent length. The species has not previously been reported as a fossil, and comes from a locality 50 to 75 miles west of the western limit of the present range of the frog in northern Texas.

Pseudacris triseriata (Wied)

MATERIAL: 1 left ilium, CM 12578, Cumberland Cave, east face, Allegany County, Maryland; "pre-Wisconsin," Pleistocene.

Pseudacris triseriata feriarum is abundant in the area today but has not previously been recorded as a fossil. Two other species of *Pseudacris* (*P. brachyphona* and *P. brimleyi*) may have occurred in the area during some stage of the Pleistocene. Both resemble *P. triseriata* in ilial anatomy but are separable in that the dorsal protuberance of *brimleyi* is shorter than that of *triseriata*, and the more anterior portion of the ventral acetabular expansion is larger in *brachyphona* than in *triseriata*. This fossil most closely resembles *P. triseriata* and is referred to that species. It differs from most specimens of *triseriata* by the unusual rugosity of the dorsal protuberance, but this may reflect individual variation or be due to erosion. However, I have seen *triseriata* with this condition.

These reports bring to 12 the number of treefrogs reported from the North American Pleistocene.

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SUMMARY

Fossil hylids are recorded from Pleistocene deposits of Maryland, Pennsylvania, Tennessee, and Texas. *Hyla crucifer*, *Pseudacris streckeri*, and *P. triseriata* are reported as fossils for the first time. A new species, *Hyla holmani*, is described from the Wisconsin (Pleistocene) deposits of Hardeman County, Texas. *Acris crepitans* and *Hyla femoralis* are also reported. Two Pleistocene range extensions are noted.

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